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THE EVOLUTION OF BIRD-SONG.

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FOR some years I have studied the voices of British wild birds, and in pursuing my investigations have become acquainted with several interesting facts which seem to indicate how bird-song has been evolved. As the notes collected relate to the songs of several hundreds of individual birds, it is impossible in these pages to give more than a general summary, together with the conclusions arrived at. Any more elaborate analysis must be deferred to a future occasion.

In the arrangement of these notes I have received much aid from Prof. Harker, F.L.S., and Mr. S. S. Buckman, F.G.S., has suggested several useful alterations in the MS.

All birds possess the power to emit a cry of distress—that is, an exclamation caused by bodily pain, or by fear, and this cry seems to be the first utterance of the young of most species. It is presumed that a cry of distress was the earliest vocal utterance within the ability of the bird or its progenitors; and it may have been originally produced accidentally by contortion of the body during combat, in which event it might have tended towards the preservation of the individuals by which it was uttered. If an outcry increased the chance of victory in combat, the inclination and ability to exclaim would become permanent, and the cry would be habitually uttered in the tone most easily produced, or most effectual in its result. It would thus become a definitely formed cry, and would soon be uttered in circumstances of danger



as well as in combat. In most birds of limited vocal compass the distress-cry is merely an exaggeration of the ordinary call-note or signal of assembly, as, for example, in the Mallard, Crow, and Rook; but fear may induce in the call-note inflections unappreciated by the human ear.

It is a curious fact that among birds of limited vocal power the call-note resembles the danger-cry (or alarm) much more than in birds of varied song. The Mallard, Crow, Rook, and Bullfinch may be mentioned as typical of the former class; and the Blackbird, Starling, Redbreast, and Nightingale as typical of the latter. This tends to prove that the call-note and the danger-cry had a common origin, namely (as before suggested), the cry of distress. This distress-cry became modified in different species and for different occasions, and developed into a cry of dismissal as well as into a call of assembly. The House Sparrow utters a characteristic note to indicate the arrival of a hawk, at the sound of which House Sparrows within hearing secrete themselves. This bird has another danger-signal, which is employed as a call-note to the young. Several species silence their young by a note of warning. I have known a Blackbird utter different notes to announce the presence of a cat or a human being. The common fowl (whose notes generally have withstood the influence of artificial selection) utters different alarm-cries to signal the approach of a dog or cat, or that of a hawk.

It may be fairly suggested that certain alarm-notes are onomatopœic, and are intended to suggest the presence of the seemingly most dreaded enemies of the bird. Such alarm-notes are the "oof" of the common pigeon,—a cry which closely resembles the sounds made by the wings of this bird when it is swooping rapidly in play, or in its efforts to avoid the pursuit of a hawk,—and the hissing sounds made by some birds of the genera *Picus* and *Parus* when nesting, and which sounds are like the hiss of that dreaded enemy of the nest, the snake. The hisses of these birds may be employed for protective purposes; but, on the other hand, they may be merely the spontaneous expressions of hatred which have been inherited from a remote ancestry.

The distress-note was probably uttered by the males of some species as a defiance-cry, and as such it would be, like the "crow" of the cock, addressed to other males rather than to females. Rival males of certain species, such as the Willow

Warbler, Chiffchaff, Redbreast, and Thrush, sing when about to fight together, and often during a combat, upon which occasions their songs are clearly intended as defiance.

Increase of fear induces a proportionately rapid and vehement repetition of the alarm-note. I have heard a Blackcap repeat his alarm-note, "tack," so rapidly as to produce a shake, like the shaking alarm-notes of the Magpie and Great Titmouse. The Blackbird's rattling alarm is simply the quick reiteration of one sharp note. The alarms of the Magpie, Missel Thrush, and male House Sparrow were probably, with those of several other birds, originated by single cries. The first alarms or danger-calls would be uttered, not only when the birds themselves were in danger, but also when their young were threatened. The first cry of the nestling young marked the commencement of a new era in bird-utterance. This cry was probably an imitation of that of parent birds uttered near their nest, and, being induced by hunger, was used as a demand for food from them. The cries of the parents near the nest would generally be alarms. A bird does not often sing in close proximity to its nest (though the popular idea is to the contrary), but exclaims in alarm when its nest is threatened. The most impatient and vehement of the young probably obtained the most food, and consequently they enjoyed the greatest chance of survival. The cries of the young would be in effect call-notes, and as such would be useful to them, and therefore would be retained after they had left the nest, especially in gregarious species, which, in a greater degree than solitary kinds, would develop these notes. In this case we should find gregarious birds garrulous,* and solitary species generally silent, and this is actually the case. Examples of the former kind are the Mallard, Starling, Siskin, Linnet, Goldfinch, and the Great, Blue, Coal, and Long-tailed Titmice; and among the latter are the *Raptores* and *Picidæ* generally, and the Redbreast, Hedge Accentor, and Wren.

The call-note, being more or less the result of imitation, would be influenced by other sounds familiar to the bird; and of these the most pleasant would be those resulting from or

* Gregariousness was probably not induced by garrulity, but by the local distribution of food, or by fear, and as a means to protection against enemies; or possibly, in birds that sleep in company, for the sake of mutual warmth.

associated with the act of feeding or of obtaining food. The sounds produced by eating would probably seem loud to the birds making them, just as with us the noise made by masticating dry toast is more noticeable to the eater of it than to his neighbour at table.

In the course of time persistent sounds might, in consequence of the involuntary or voluntary imitateness of a bird, modify its call-note, in the same way as they have undoubtedly affected the character of the song of at least one individual wild song-bird, subsequently mentioned. It is also possible that certain call-notes may have been intentionally modified to a resemblance of the sounds made in obtaining food, and for the purpose of suggesting those sounds to other birds;* but often there is certainly, from whatever cause arising, a great similarity between the call-notes of birds, and the sounds which are occasioned by their obtaining food or eating it. Instances of this may be found in the hawks, whose call-notes are screams, like those of their victims; in the Common Butcher-bird, which has a note resembling the distress-cry of the frog, on which it preys; in the Blackbird and Thrush, which at times make a clicking sound that is the foundation of the reiterated alarm-notes of the former bird. This is an imitation of the "clicking" sound produced when a snail is broken against a stone, the snail, as is well known, being a favourite food of these birds, and its shell is generally fractured in this way. The Blackbird, Thrush, and Missel Thrush frequently end their phrases in some bubbling, uncertain, high notes, which are sometimes exactly like the noises made by a bruised snail when retreating into his shell. The Spotted Flycatcher utters short, harsh, grating cries: the crushing of flies or bees and lesser insects between two thin pieces of wood causes somewhat similar sounds. The Swallow's call-note, "clit," reminds one of the breaking of the wing-case of a small beetle. The Sedge Warbler and Blackcap have each a harsh, short note, not unlike the snapping sounds made by their bills in seizing insects. The call-note of the Wren, uttered most frequently during autumn, is closely like the chirp of the common hedge-cricket, an insect that abounds at that season, and is probably

* The behaviour of the barn-door cock, which when calling his hens pretends to be picking food, warrants the suggestion.

eaten by the Wren.* The jarring sound produced by the Night-jar is only the repetition of a single note, a sort of "click" (like the noise of breaking the wing-case of a large beetle), and this note, rapidly repeated, reproduces the "blurring" of the wings of a beetle, as they vibrate against the beak of a bird seizing it in flight. The "tell-tell" cries of the Greenfinch, House Sparrow, and some other finches seem to have been derived, like the "pink, pink" of the Chaffinch, from the sounds made by these birds in cracking cases of hard seeds, such as hemp. The "did-it" cries of the Greenfinch, Chaffinch, Goldfinch, Linnet, Yellow Bunting, and Cirl Bunting may have similarly originated in the noises made in the breaking or moving of food within the beak. Both of these cries—"tell, tell" and "did-it"—are always call-notes, except sometimes in the House Sparrow, when the "tell, tell" is used as an alarm. The hard cry, "clit," of the Hawfinch is distinctly a brittle sound. This bird is a berry-breaker. The notes of the Green Woodpecker are distantly like the sounds produced by the strokes of his bill on dry, hollow wood. The harsh tones of the Rails suggest the crashing of the tender shells of the mollusks upon which they partly subsist. In the song of the Starling are some "whirring" sounds (generally uttered near the beginning of a phrase), which resemble the noise made in pulling a large worm from his hole. The "cup, cup" calls of the common fowl are not unlike the sounds made by it in eating grain, which rattles within the beak of the bird.

Males wishing to attract the females during the season of courtship would make great use of the call-note. Some males would certainly be able to utter this note in louder tones than others, and would possibly on this account be more pleasing to the other sex. It is also possible that in the rivalry between the males various modifications would be introduced, and that those uttering the most pleasing call-notes and variations would be preferred by the females. Of these modifications those that most closely resemble the noises made in eating or obtaining food would very probably have been most pleasing to the females. A male bird having only one note, or character-sound, in his voice

* This is very doubtful, the insect prey of the Wren being much more minute.—ED.

(*e. g.* Mallard, Crow, Tree Creeper) would address his mate in that one note, and, under the influence of sexual ardour, would repeat that note many times in succession. The number of repetitions uttered at one time would probably depend upon the amount of breath expended in uttering each note; thus, if an inspiration were taken for each note, the utterance might be extended, as it is in the case of the Grasshopper Warbler,* but if one breath were employed for several cries the number of these could not be great. Such repetitions would be frequently uttered in the same successive intervals of pitch, in the same way as the cries of our railway porters and street hawkers are gradually regulated to unvarying repetitions.

It may be asked why, if this occurs, do we hear so many birds, like the Crow and Duck, which, having limited voices, utter no defined phrase? The answer is that their general mode of life, or the brevity of their courtship, has been unfavourable to vocal development. It is certain that the young of many song-birds (*e. g.* Lark, Chaffinch, Yellow Bunting, Cirl Bunting, and Greenfinch) develop their first songs and phrases from mere repetitions of their call-notes, as may be observed in autumn or early spring; and the suggestion that the remote progenitors of these birds acquired during the lapse of generations what their descendants can gain in a month, is supported by physiological analogies. The most familiar instance of the construction of a phrase by means of repetitions is found in the common barn-door cock, which, when first attempting to "crow," utters merely an ordinary alarm-cry (which is also the "crow" of the broody hen), and repeats this several times in rapid succession. Improving with practice, he is soon able to blend the notes together, and form the complete "crow."

We now arrive at the consideration of restricted bird-song, which consists of vocal sounds, neither call-notes nor danger-cries, uttered by birds. The first songs seem to have been, as above suggested, arbitrary phrases composed of repetitions of call-notes. The songs of the Nuthatch, Green Woodpecker, Tree Creeper, Bullfinch, and Cirl Bunting (and Ortolan Bunting, so far as I have heard in two individuals), are nothing more than

* Many extended bird-phrases seem to be accompanied by a rapid movement of the lungs similar to that which occurs during human laughter.

such repetitions slightly varied in pitch. The songs of the Chaffinch, Greenfinch, Goldfinch, House Sparrow, Linnet, Blue Titmouse, Great Titmouse, Coal Titmouse, Yellow Bunting, Swallow, and Jackdaw contain little more than such repetitions; and the Starling, Wren, Meadow Pipit, and Sky Lark frequently introduce into their songs their respective call-notes. In the songs of the Grasshopper Warbler, Willow Warbler, Wood Warbler, Redstart, and Nightingale also there are traces of the construction of phrases by repetition of single cries. The arbitrary phrases were probably further developed by the imitativeness of the birds which attempted to reproduce surrounding noises with which they were familiar; and we can find evidence of this modulation in the present songs of many birds. The prevalent long, hooting cries of the *Strigidae* are like the howls of wolves, and also resemble the moaning and whistling of wind in holes in trees or rocks, the favourite nesting-places of these birds. The shrieking cry of the Swift suggests the "swish" of its wings in swooping, or eager pursuit of its fellows: the Swallow and Martin do not scream, nor have they the pursuing habit of the Swift. The Dipper sings, like his solitary companion, the Wren (Yarrell's 'British Birds,' 4th edit. vol. i. pp. 174—176). The call of the latter, as already stated, resembles the note of the hedge-cricket. The song of the Redbreast seems to be, in its general character, an imitation of the gurgling of water: in summer the bird is very often near water. The "crake" of the Landrail is in time and tone closely like the noise made by the grazing of a cow.* The sibilant phrase of the Wood Warbler reminds us of the frictional sounds made by branches that rub against each other. The Grasshopper Warbler has modified and extended the same phrase to a resemblance of the cry of the field-cricket. The "quack" of the Mallard is like the croak of frogs. Many

* Cattle when grazing protrude the tongue from each side of the mouth alternately, each time round a bunch of grass, which is torn off. A pause then occurs during the act of swallowing, after which the tearing is resumed. The consequence is a sound which may be thus expressed, "rasp rasp—rasp rasp—rasp rasp." Cattle graze more at night than in the daytime; and the Landrail is to a great extent nocturnal, and although the feeding-grounds of cattle are not the nesting-places of this bird, it is frequently within ear-shot of grazing, the sound of which is particularly noticeable at night.

birds reproduce less persistent sounds, which will be subsequently mentioned.*

It seems that certain species never advanced beyond the cry of distress; while others have acquired one or two unvarying, or as we call them, "arbitrary phrases," which are respectively employed under definite circumstances, such as the presence of an enemy or of a bird of the opposite sex. Others, again, may display a voice of great range in pitch, and variety of tone.

The songs of birds are not immediately acquired, but are developed in each individual by practice and cultivation; and the more frequent the practice the more elaborate the song. In autumn the young male Sky Larks, Thrushes, and Blackbirds begin to sing; and their first efforts result in objectless variations of tone, which, however, soon betoken traces of imitation. Their songs are generally lost during winter, but are regained, and with increased power, at the approach of spring.

Among birds, as among men, leisure is necessary to the development of song, and may to some extent induce it. The cause of the frequent imitativeness of captive birds† may perhaps be found in their security and idleness. It is not contended that leisure would make a bird of harsh voice musical; but none will dispute that if a song-bird be constantly harassed it will not sing. The constant employment of the brain in detecting and avoiding danger, or in the occupation of getting food, hinders any tendency to develop song. It is possible that want of leisure, and a feeling of insecurity, may have prevented the elaboration of song amongst birds of torrid regions, where they are continually pursued by enemies, engaged in battle among themselves, or are labouring to obtain food, and where their increase is checked by violence rather than by the climatic influences that in temperate zones periodically lessen their numbers. If the suggestion that leisure is necessary to song be correct, we should find limited voices in birds that are much occupied either in obtaining food or avoiding enemies. Such is the fact. Of the former class are the *Raptores* and *Picidæ*, of the latter the *Rasores*. The *Anatidæ* may belong to both.

* The Squirrel and the Snake reproduce in their respective alarm-cries the sounds made by these animals during rapid retreat; the former making a snapping and swishing noise, and the latter a hissing, rustling sound.

† This paper does not otherwise refer to the notes of birds in captivity.

It is to be observed that, besides leisure, meditation is necessary to song, and that lethargy militates against the development of the voice. Birds whose food is precarious (*e.g.* the *Raptores* and *Colymbidæ*) are generally either hungry or gorged, and consequently vigilant or lethargic; hence they have but little inclination to vocal exercise. It is probable that characteristic peculiarities of movement during song (such as flight, which seems to be, then, an exaggeration of the fluttering of the wings that is frequently a call-action in young, and sometimes in adult birds) have been developed contemporaneously with variations in the voice.

Certain birds (*e.g.* the Redbreast, Wren, Accentor, Blackbird, and Blackcap) imitated mellow tones, and intervals of pitch, rather than other characters of sounds; and the music thus reproduced might have been heard in the murmurs of streams, or in other naturally or artificially produced noises. It also appears that intervals of pitch in human music are sometimes imitated and clearly reproduced by birds. I have recorded a great number of such instances. At Stroud the Thrushes often utter a phrase which I have heard for nearly twenty years whistled, as a call, by the boys of that neighbourhood. At Frocester, in Gloucestershire, near the church, I have heard at least two Blackbirds and two Thrushes sing, fairly correctly, two distinct musical phrases. In the construction of arbitrary phrases combativeness may have had some influence, for certain parts of the songs of the Greenfinch, Goldfinch, and Starling are never sung to the female, but are uttered defiantly. The same ardour which has induced the development of the arbitrary phrase has caused its variation. In this, as in the production of many arbitrary phrases, variation has been guided by imitation; but not invariably so, for some individual birds (*e.g.* Greenfinches, Chaffinches, and Wrens) vary the pitch and the number and quality of the "character-sounds" in their phrases in a way that suggests no attempt at mimicry. On the other hand, certain birds (*e.g.* the Blackbird, Missel Thrush, and Redstart) continue their songs, after the utterance of ordinary or arbitrary phrases, in imitations. The Blackcap often sings in this way, but is noticeable as sometimes preluding its mellow phrases with softer imitations.

Many birds reproduce in song the notes of others. So far as

I know, the best British mimics are the Sedge Warbler, Starling, Thrush, Sky Lark, Redbreast, Blackbird, Missel Thrush, Blackcap, Redstart, Whitethroat, and Nightingale; the better mimics being here mentioned first. I have not heard the song of the Wood Lark. The mimicry is not immediately acquired, but is the result of practice. The first autumnal songs of the Starling and Redbreast, heard in August, are scarcely imitative, for the birds have then been silent for a time, and have forgotten most of their imitations. The Starling sings well in autumn, but is most imitative and vehement in spring. In autumn young Thrushes and Blackbirds practise *sotto voce* imitations of the songs of other birds; but these imitations are lost in winter, and are slowly resumed during spring; consequently the summer songs of these birds are richer in imitations than are those uttered in early spring. It is natural that birds should imitate only those notes that are frequently heard in their haunts; and their songs are, in fact, in a great measure restricted to such sounds. At Weston-super-Mare the Thrushes imitate frequently the cry of the Dunlin, a common and noisy bird there; and in April, 1889, a Thrush that lived in a shrubbery close to the beach uttered little more than this cry, which he varied so often that I at first mistook his song for the notes of a flock of Dunlins, but was undeceived when I saw the singer at the distance of only a few yards. A similar cry was uttered by Thrushes near Clifton Bridge. At Stroud these birds sometimes utter a note like that of the Dunlin, but also like that of the female and young of the Tawny Owl; and the utterance is induced, as I believe, by the cries of the latter birds, for Dunlins are never found near Stroud, where this Owl is common. The Thrushes at this town are very partial to a cry which has been named "be quick," and this they insensibly blend into imitations of the cry "tewit" of the Nuthatch, from which it was probably derived. The first spring or winter songs of the Thrushes at Stroud are little more than repetitions of this exclamation. The songs of the Starling and Sky Lark also betray the influence of the respective surroundings of individual birds. I have tabulated some of my records of the imitations sung by a few of the best mimics. These tabulated records of each species were made within the space of a year, and they include in the aggregate about 3000 phrases. In all my records, immediately consecutive repetitions

of a note were counted as one phrase. I have a large number of untabulated records of bird-song, made in several districts, including Gloucester, Clifton, Bournemouth, Malmesbury, Cirencester, Bath, Weston-super-Mare, and Stroud, and from them my inferences have been principally deduced. The tables relate only to songs heard within eight miles of Stroud, including an area of much physiographical diversity. The tables are far too bulky for insertion in these pages, and only a few extracts from them need now be produced. They show that the Thrushes (about fifty) sang 1120 phrases, each of which comprised one or more notes resembling the sounds made by other species, and 450 other phrases that had not a like recognisable similarity.

The following table shows the numbers of the phrases in which the six subjects most frequently imitated were mimicked by, and by how many of, these Thrushes:—

Bird imitated.		Phrases including imitation.		Number of imitative Thrushes.
Nuthatch* ...	...	136	...	37
Wood Warbler ...	...	133	...	37
House Sparrow ...	...	103	...	36
Blackbird's alarm ...	...	78	...	31
Blue Tit ...	...	57	...	24
Great Tit ...	...	47	...	24

The Redbreasts (about sixty-five) sang 1316 tabulated phrases, 905 of which were recognised as containing an imitation. The following table shows the same particulars as those contained in that above given:—

Bird imitated.		Phrases including imitation.		Number of imitative Redbreasts.
Blackbird ...	...	132	...	47
Coal Tit ...	...	89	...	44
Accentor ...	...	75	...	42
Greenfinch ...	...	79	...	39
Lark ...	...	99	...	36
Blackcap ...	...	57	...	23

The Larks (about thirty-one) sang 345 imitations, the most frequent of which may be set out as follows:—

* The tables do not record a sufficient number of imitations of notes of the Nuthatch. In early spring I often passed, as not worth notice, Thrushes whose notes then consisted almost entirely of modifications of the cries of this bird.

Bird imitated.	Number of imitations.		Number of imitative Larks.
Cirl Bunting, or Yellow Bunting	53	...	31
Swallow	30	...	21
Meadow Pipit	29	...	19
Blackbird's alarm	21	...	15
House Sparrow	23	...	14
Peewit	21	...	13

The Starlings (eighteen) sang 275 imitations, which were related principally to the subjects, and in the proportion set out in the following table:—

Bird imitated.	Number of imitations.		Number of imitative Starlings.
House Sparrow	36	...	14
Greenfinch	22	...	10
Yellow Bunting's or Cirl Bunting's } song	15	...	10
Partridge	29	...	9
Green Woodpecker	16	...	9
Jackdaw	22	...	8

Nine Sedge Warblers sang altogether 281 imitations, a few of which are contained in the next table. The birds were heard near human habitations:—

Bird imitated.	Number of imitations.		Number of imitative Sedge-birds.
House Sparrow	42	...	9
Chaffinch	24	...	8
Starling	20	...	8
Blackbird's alarm	19	...	7
Wagtail's cry	18	...	6
Swallow	21	...	5

The total number of different imitations sung by the Thrush seems to be about forty, while the Redbreast, Sky Lark, Starling, and Sedge Warbler have thirty each.

The more imitative song-birds appear to be readily influenced by changes in the more persistent sounds that are frequent around them. I give here an extract from one of my tables, showing the changes induced in the song of the Redbreast by the songs of some of the summer visitors to Britain:—

FROM SEPT. 1887, TO 1ST APRIL, 1888.

Number of Redbreasts . . . 50
 Total of phrases . . . 890

FROM 1ST APRIL, 1888, TO AUGUST, 1888.

Number of Redbreasts . . . 16
 Total of phrases . . . 426

Birds imitated.	Percentage of imitations in total of phrases.	Percentage of imitations in total of phrases.	Amount of change per cent.
Chaffinch* ...	4	1.1	2.9 decrease.
Lark ...	7.9	5.3	2.6 "
Accentor ...	6	4.9	1.1 "
Wood Warbler ...	2.9	4.9	2 increase.
Blackcap ...	3.3	6.3	3 "
Willow Warbler...	.6	5.8	5.2 "

In comparing the phrases of the Thrush heard in the first months of the year with those heard in May and June, a change of song, similar to that shown in the first table is noticed; and we find that in the latter period the Blackbird's alarm is, proportionately with the other imitations, much less often uttered; while the reproduced notes of the Cuckoo, Wood Warbler, and Butcher-bird (or Wryneck†) then become much more frequent. In order to avoid a possible wish to discover certain notes in the songs of birds, that might have biassed my judgment, I did not until a few months since make any numerical calculation about my records.

In recording imitations I used phonography, in which the names of birds imitated were at once written, and often the names also of some of their cries, such as the House Sparrow's "tell-tell" or "philip," or the Warblers' "tewy," which, like many other notes, are invariable and easily recognised. Some imitations are more easily recognised than others, either on account of the character of the voice of the singer or that of the note reproduced. Full voices cannot easily produce harsh notes; and the cries of certain widely distinct species are so much alike as to defy accurate recognition when mimicked. On the other hand, a small percentage of the imitations recorded by me were exact reproductions.

Birds that sing long imitative phrases (*e.g.* Starling, Sky Lark, Sedge Warbler) often utter in one phrase a succession

* "Chaffinch" here denotes all the cries of the Chaffinch, most of which are uttered during winter.

† The call-notes of the Butcher-bird and Wryneck are similar.

of different imitations. This habit has not been accounted for in my tables, and therefore the actual proportions of imitative to unimitative phrases were less than those stated. Some of the imitations were particularly interesting. I have heard Starlings reproduce the sounds made by the woodman's axe; and in two instances the singer paused between each of these imitations, as if to attain correctness of mimicry in point of time as well as in tone. This was the more noticeable since the Starling rarely pauses in the utterance of a phrase. A Sedge Warbler singing at ten o'clock at night reproduced exactly the fast-fading cries of a Chaffinch flying away. This warbler then repeated in succession all the vehement alarm-cries which announce the arrival of a hawk, and continued his song with the single "tell" cries with which the male House Sparrow, watching as a sentinel, warns his neighbourhood that the hawk is very near. Then these sounds ceased. Suddenly the usual song of the Sedge Warbler was resumed. The song of this bird was, in any event, evidence of his acute memory; but might it not have been an intentional picture, in sound, of an incident of bird-life? I submit that there are grounds for supposing the latter view to be correct; and if it should be so, may not all bird-song be to a variable extent intended to suggest pleasing impressions of surroundings to the objects of the song? Human songs are full of suggestions of surroundings, in which the sounds uttered by creatures are often imitated in the names of those creatures; and in the songs of birds we find an analogous reproduction of the notes of surrounding animals. May not the purpose of this mimicry be in both cases the same?

CONCLUSION.—From this paper, the following conclusions may be drawn:—Bird-song originated in a cry produced by bodily contortion. This cry was developed by use in times of danger. It then became a warning-note that was elaborated into a call-note. This note was repeated by males in varied tone and pitch; and several influences tended to make it a reproduction of surrounding persistent sounds. The call-notes were repeated by the males to the females; and in this manner arbitrary phrases were constructed. Further efforts on the part of the males induced greater variety, which took the form of imitation of other sounds.

A CATALOGUE OF LOCAL LISTS OF BRITISH BIRDS.

BY MILLER CHRISTY.

LISTS of the Wild Birds frequenting particular counties or districts are now generally acknowledged to be of considerable value as contributions towards a complete knowledge of the Birds of Great Britain and Ireland. These lists have now become so numerous that it is time some attempt were made to compile a systematic catalogue or bibliography of them, especially as many of them are difficult of access, through their having been published either in the Transactions or Journals of local Societies, or in pamphlet form, or are almost unknown, because hidden away in County Histories, local Topographies or Guide-books. The following is, I believe, a first attempt in this direction; and, as such, it is necessarily far from complete. I trust, however, that it will be found to contain the more important local lists, and in any case it will serve as a basis on which to erect a more satisfactory structure.

With scarcely an exception, I have excluded all volumes or articles which do not aim at giving a *tolerably complete list* of the Birds inhabiting the districts of which they treat. Mere notes or observations on a few species only are, therefore, entirely omitted, even although they may be purely local. Similarly, I have not thought it needful to include any general works on the Birds of Great Britain and Ireland as a whole, though those on the Birds of England only, or on those of Scotland, Wales or Ireland only, have, of course, been inserted, because they may be fairly regarded as "local."

In every case, the titles of the volumes or articles entered in my bibliography have been taken by me direct from the works themselves, and have not been obtained second-hand, except in those few instances in which I clearly state that I have not myself seen the works in question.

I must apologize for a slight want of uniformity in the arrangement and wording of the details of the various entries, which is due to their having been noted down at many different times and places, as I happened to come upon the works in question. I believe, however, it will be found that the information given is sufficient for all practical purposes.

The system on which I have worked may require a few words of explanation. The titles of the works catalogued are arranged chronologically under counties, the latter being divided under England, Scotland, Wales and Ireland. The details are entered in the following order:—Surname of author, Christian name (in parentheses), as much of the title as is necessary for identification, the name of the magazine or volume in which the article or list in question appeared (if not separately published), place of publication, shape, and date, followed in many cases by a few brief remarks on the work catalogued. The date of publication has, contrary to custom, been placed after the size and shape, for convenience of reference. In the case of magazine articles or of lists which form portions only of larger works, the title of the magazine or work of which they form part has been given in *italics*, for the sake of distinction.

The catalogue will, of course, indicate at a glance those counties whose avi-fauna has received most attention; but it may be as well to point out those which have received least, and which, therefore, chiefly require that some local observer should undertake the work of setting forth the main peculiarities of their avi-fauna. Taking England first, the list shows that not a single contribution has yet (so far as I know) appeared in relation to the counties of Monmouth or Warwick, which are, therefore, obviously in want of some attention from local ornithologists. The following counties, though they have not altogether escaped attention, have had their ornithological features most inadequately treated:—Bedfordshire, Cheshire, Derbyshire, Huntingdonshire, and Surrey; while Hampshire, Hertfordshire, Lincolnshire, Staffordshire, and Westmoreland, without being quite so badly off, still stand in need of more attention than they have yet received. Turning to Scotland, one may note that the birds of many districts have been very carefully studied by several different observers, while Gray's *Birds of the West of Scotland*, the works of Messrs. Harvie Brown, Buckley, and of some others, are models of their kind. Nevertheless, there are comparatively few Scotch counties which have received the attention in the way of separate and often bulky works on their birds which many English counties have received, and a good deal of local work still remains to be done. The twelve Welsh counties have scarcely received any attention at all, only two having been anything like adequately treated,

namely, Breconshire and Pembrokeshire. Ireland as a whole has been thoroughly treated in Thompson's well-known work, there being in addition several good lists of Irish birds; but in the way of local lists, very little indeed has as yet appeared, there not being a single county which has had its birds described in a separate volume entirely devoted to the subject, as in the case of many English and some Scotch counties. It appears, therefore, that there still remains much to be done, especially in Wales and Ireland, before we can claim to have anything like a complete and detailed knowledge of the distribution of the Birds of the British Islands.

As I have doubtless overlooked some local lists which should have been included, I shall feel much obliged to readers who will call my attention to such omissions, as it is intended to strike off separate copies of the list, and the type will be kept standing for one month in order to include additions and corrections in the reprint.

I have to acknowledge the kind assistance which I have received during the compilation of this list from Mr. J. H. Gurney, and Mr. J. E. Harting, who rendered me valuable help while the catalogue was in the press.

ENGLAND.

BEDFORDSHIRE.

Miller (S. H.) and Skertchley (S. B. J.)—Birds of the Fen-land. *The Fen-land: Past and Present*, pp. 362-388. London, 8vo, 1878. (Enumerates 244 species.)

BERKSHIRE.

Kennedy (A. W. M. Clark)—The Birds of Berkshire and Buckinghamshire. Eton and London, 8vo, 1868. (Enumerates 225 species.)

Lamb (Dr. T.)—Ornithologia Bercheria. *Zoologist*, 3rd series, vol. iv., pp. 313-325. London, 8vo, 1880. (Prepared about 1814 for the *Trans. Linn. Soc.*, but not published by the Society.)

BUCKINGHAMSHIRE.

Kennedy (A. W. M. Clark)—The Birds of Berkshire and Buckinghamshire. Eton and London, 8vo, 1868. (Enumerates 225 species.)

CAMBRIDGESHIRE.

Jenyns [afterwards Blomefield] (Rev. Leonard)—Observations on the Ornithology of Cambridgeshire. *Trans. Cambr. Philos. Soc.*, vol. ii., pp. 287-324. Cambridge, 4to, 1827. (An admirable list, enumerating 158 species.)

Jenyns [afterwards **Blomefield**] (**REV. LEONARD**)—The Ornithology of Cambridgeshire. *The Naturalist* (Neville Wood's), vol. iii., p. 89. London, 4to, 1838.

———The Fauna of Cambridgeshire. London? 8vo, 1846. (Not seen.)

Miller (S. H.) and **Skortchley (S. B. J.)**—Birds of the Fen-land. *The Fen-land: Past and Present*, pp. 362-388. London, 8vo, 1878. (Enumerates 244 species.)

CHANNEL ISLANDS.

Ansted (D. T.) and **Latham (R. G.)**—The Channel Islands. London, 8vo, 1862. (Enumerates 198 species; a second edition appeared in 1865.)

Smith (Cecil)—The Birds of Guernsey and the Neighbouring Islands, [&c.] London, 8vo, 1879. (Enumerates 176 species.)

CHESHIRE.

Leigh (Chas., M.D.)—The Natural History of Lancashire, Cheshire, and The Peak in Derbyshire [&c.]. Oxford, fol., 1700.

Brockholes (J. F.)—On Birds observed in Whirral, Cheshire. *Proc. Chester Soc. Nat. Sci.*, No. 1, 16 pp. Chester, 8vo, 1874. (Enumerates 168 species.)

CORNWALL.

Borlase (REV. WM., F.R.S.)—The Natural History of Cornwall, [&c.] Oxford, fol., 1758.

[**Anon.**]—A List of the Quadrupeds, Birds and Fish of the Counties of Cornwall and Devon. *The Monthly Magazine*, vol. xxvi., pp. 433 and 527. London, 8vo, 1808.

Couch (J.)—A Cornish Fauna: Being a Compendium of the Natural History of the County, [&c.]. Truro, 8vo, 1838. (2nd edition, Truro, 8vo, 1878.)

Cocks (W.P.)—Contributions to the Fauna of Falmouth. *The Naturalist* (Morris's), vol. i., pp. 37, 63, &c. London, 8vo, 1851.

Rodd (Ed. Hearle)—A List of British Birds, as a Guide to the Ornithology of Cornwall, especially in the Land's End District. London and Penzance, 8vo, 1864. (Second edition in 1869.)

Bullmore (W. K., M.D.)—Cornish Fauna: a Short Account of all the Animals found in the County, (Birds, pp. 7-45.) Truro, 8vo, 1867.

Hill (F. V.)—Catalogue of Birds observed in the Lizard District. In *Rev. C. A. Johns' Week at the Lizard*, pp. 257-266. London, 8vo, 1874. (A previous edition in 1848.)

Rodd (Edward Hearle)—The Birds of Cornwall and the Scilly Islands. Edited, with an Introduction, by J. E. Harting. London, 8vo, 1880. (Enumerates 290 species.)

CUMBERLAND.

Heysham (DR. JOHN)—List of Cumberland Birds. In *Hutchinson's History of Cumberland*, vol. i., pp. 4-23. Carlisle, 4to, 1794. (Enumerates 169 species.)

Stanley (J., M.D.)—Birds in the Neighbourhood of Whitehaven, Cumberland. *Loudon's Mag. Nat. Hist.*, vol. ii., pp. 275-276, and vol. iii., pp. 171-172. London, 8vo, 1829-1830. (Not of much importance.)

Macpherson (Rev. H. A.) and Duckworth (W.)—The Birds of Cumberland, including notes on the Birds of Westmoreland. London and Carlisle, 8vo, 1885. (Enumerates 250 species; see additions in *Zoologist*, 3rd series, vol. xii., p. 328, 1888.)

DERBYSHIRE.

Leigh (Chas., M.D.)—The Natural History of Lancashire, Cheshire and the Peak in Derbyshire, [&c.]. Oxford, fol, 1700.

DEVONSHIRE.

[Anon.]—A List of the Quadrupeds, Birds and Fish of the Counties of Cornwall and Devon. *The Monthly Magazine*, vol. xxvi., pp. 443 and 527. London, 8vo, 1808.

Turton (W.) and Kingston (J. F.)—Natural History of the District of Teignmouth. Birds, 34 pp., unpagged. Teignmouth, 12mo, n.d. (c. 1810).

Moore (Ed., M.D.)—On the Ornithology of the South of Devon. *Trans. Plymouth Institution*, pp. 289-352. Plymouth, 8vo, 1830. (Enumerates 232 species.)

———The Birds of Devonshire. *Mag. Nat. Hist.*, n.s. vol. i., pp. 113, &c. London, 8vo, 1837.

Bellamy (J. C.)—The Natural History of South Devon. Plymouth and London, 8vo, 1839. (Enumerates 247 species.)

Rowe (J.)—A Perambulation of Dartmoor. Plymouth, 8vo, 1843. (Ornithology occupies pp. 227-234.)

Rowe (J. Brooking)—A Catalogue of the Mammals, Birds, Reptiles, and Amphibians of Devon. London and Plymouth, 8vo, 1863. (Enumerates 268 species; birds occupy pp. 13-46.)

Chanter (John R.)—A History of Lundy Island. Birds, pp. 48-53. Exeter, 8vo, 1871. (Reprinted from *Trans. Devon. Assoc. Sci. Lit. & Art*, 1871; enumerates 137 species.)

D'Urban (W.S.M.)—A Sketch of the Natural History of South Devon [including a list of Birds]. *The Handbook of Exeter*, App., pp. xxvii-xxxvi. Exeter, 8vo, 1875. (Enumerates 276 species.)

———The Birds of Devonshire. (In preparation.)

Parfitt (E.)—The Fauna of Devon. Part xiv. Birds. *Trans. Devon. Assoc. Sci. Lit. & Art*, 1876, pp. 245-310. Exeter, 8vo, 1876.

Pidsley (W. E. H.)—The Birds of Devonshire. (In the press.)

DORSETSHIRE.

Pulteney (Richd., M.D., F.R.S.)—Catalogues of the Birds, Shells, and some of the more rare Plants of Dorsetshire, from the new and enlarged edition of Mr. Hutchins's *History* of that County. London, folio, 1779. (Birds occupy pp. 1-22; an enlarged edition in 1813).

Dale (J. C.)—Catalogue of the Mammalia, Birds, Reptiles, and Amphibians found in Dorsetshire. *The Naturalist* (Neville Wood's), vol. ii., pp. 171-183. London, 8vo, 1837.

Mansel-Pleydell (J. C.)—List of the Rarer Birds of the County [of Dorsetshire]. In Hutchins's *History and Antiquities of the County of Dorset*, [&c., &c], 3rd ed., vol. i., pp. cxv.-cxxx. Westminster, fol., 1861-74. (An extensive and considerable list.)

Harting (J. E.)—Birds breeding on the Dorsetshire Coast. *Zoologist*, vol. xxiii, pp. 9665-9678. London, 8vo, 1865.

Mansel Pleydell (J. C.)—Ornithology and Conchology of the County of Dorset. London and Blandford, 8vo, 1873. (Ornithology occupies pp. 1-58.)

Dale (C. W.)—The History of Glanville's Wootton in the County of Dorset, including its Geology and Botany. London, 8vo, 1878. (Contains a List of Birds, which enumerates 92 species).

Mansel-Pleydell (J. C.)—The Birds of Dorset, with Illustrations by G. E. Lodge. London, 8vo, 1888.

DURHAM.

Sharpe (Sir Cuthbert)—A List of Birds observed at Hartlepool. In his *History of Hartlepool*, p. 1049. Durham, 8vo, 1816. (Enumerates 68 species; 2nd edition, Hartlepool, 8vo., 1851).

Selby (P. J.)—A Catalogue of Birds hitherto met with in the Counties of Northumberland and Durham. *Trans. Nat. Hist. Soc. Northumb. Durh. and Newcastle-on-Tyne*, vol. i., pp. 244-290. Newcastle, 4to, 1831. (Enumerates 214 species.)

Hogg (John)—A Catalogue of Birds observed in South-Eastern Durham and North-Western Cleveland, with an Appendix, [&c.] *Zoologist*, vol. iii., pp. 1049, 1106 and 1169. London, 8vo, 1845. (Enumerates 126 species; also reprinted separately; pp. 1-50.)

Proctor (Wm.)—List of Birds found in the County [of Durham]. In Rev. G. Ornsby's *Sketches of Durham*, pp. 196-201. Durham, 8vo, 1846. (Enumerates 202 species.)

Hancock (John)—A Catalogue of the Birds of Northumberland and Durham. *Trans. Nat. Hist. Soc. Northumb. and Durh.*, vol. vi., pp. xxvi.—174. London and Newcastle-on-Tyne, 8vo, 1874. (Enumerates 265 species.)

Nelson (T. H.)—The Ornithology of the District around Redcar, 34 pp. Bishop Auckland, 8vo, 1877.

Backhouse (J., Jun.)—The Avifauna of Upper Teesdale. *The Naturalist* (Y.N.U.), vol. x., pp. 353-364. Leeds, 8vo, 1885. (Also reprinted separately.)

Lebour (Prof. G. A.)—Handbook to the Geology and Natural History of Northumberland and Durham. *Brit. Assoc. Handbook*. Newcastle-on-Tyne, 1889. (Not seen; includes birds.)

ESSEX.

Doubleday (Edw.)—A Catalogue of Birds which have occurred in the Neighbourhood of Epping. *Entomological Magazine*, vol. iii., pp. 288-293. London, 8vo, 1835.

K[ing (Wm. Doubleday)]—A List of Birds found in the Neighbourhood of Sudbury. *Fulcher's Sudbury Magazine*, p. 126. London and Sudbury, 4to, 1838. (Enumerates 130 species; afterwards reprinted separately.)

Day (Geo.)—The Birds of Essex. *Chelmsford Chronicle*, August 6th to September 17th, 1880. (A series of seven articles; does not contain much original matter.)

[Harting (J. E.)]—The Birds of Epping Forest. In E. N. Buxton's *Epping Forest*, pp. 84-101. London, 8vo, 1884. (A second edition in 1885.)

[Harting (J. E.)]—The Birds of Epping Forest. In Lindley's *Walks in Epping Forest*, pp. 122-128. London, oblong 8vo, 1887.

Christy (Miller)—The Birds of Essex: a Contribution to the Natural History of the County, with numerous illustrations. London, Chelmsford, and Buckhurst Hill, 8vo, 1890. (Enumerates 276 species.)

GLOUCESTERSHIRE.

Knapp (J. L.)—The Journal of a Naturalist. London, 8vo, 1829. (Contains numerous observations on the Birds of Western Gloucestershire.)

Nicholls (H. G.)—The Forest of Dean. London, 8vo, 1868. (Birds are treated in Chapter xiii.)

HAMPSHIRE.

Warner (Rev. Richard)—Of the Ornithology of the Isle of Wight. In his *History of the Isle of Wight*, [&c.], chap. iv., pp. 225-246. Southampton and London, 8vo, 1795.

Bury (Rev. C. A.)—Notes on the Birds of the Isle of Wight. *Zoologist*, vol. ii., p. 644, and vol. iii., p. 915, &c. London, 8vo, 1844.

More (A. G.)—[Ornithology of the Isle of Wight]. In Venable's *New Guide to the Isle of Wight*, pp. 412-437. London, 8vo, 1860. (Enumerates 220 species.)

Wise (J. R.)—[Birds of the New Forest]. In his *New Forest: Its History and its Scenery*. London, 4to, 1863. (Enumerates 230 species; there are several subsequent editions.)

Willmore (J. H.)—Lecture on Birds of the Neighbourhood of Queenwood; their Nests and Eggs. London, 12mo, 1874. (Not seen.)

Kelsall (J. E.)—The Birds of Hampshire and the Isle of Wight. (In preparation: see *Science Gossip*, 1880, p. 91.)

HEREFORDSHIRE.

Lingwood (R. M.)—A Short Outline of a Fauna for part of Herefordshire. *Annals of Nat. History*, vol. v., pp. 184-188. London, 8vo, 1840. (Enumerates 76 species.)

Lees (Edwin)—Birds of the Malvern District: Resident, Migratory, and Occasional Visitors. *Zoologist*, 2nd series, vol. vi., pp. 2517, 2631, and 2659. London, 8vo, 1871. (Reprinted from *Trans. Malvern Naturalists' Field Club*.)

Bull (H. G., M.D.)—Notes on the Birds of Herefordshire. London and Hereford, 8vo, 1888. (A posthumous work of little merit.)

Horne (George)—An Authenticated List of the Birds of Herefordshire. Hereford, 8vo, 1889. (Enumerates 196 species.)

HERTFORDSHIRE.

Littleboy (John E.)—Notes on Birds observed in Hertfordshire in 1887, [&c.] *Trans. Herts. Nat. Hist. Soc.*, vol. v., p. 76. Hertford, 8vo, 1888. (Enumerates 201 species.)

HUNTINGDONSHIRE.

Miller (S. H.) and Skertchley (S. B. J.)—Birds of the Fen-land. *The Fenland: Past and Present*, pp. 362-388. London, 8vo, 1878. (Enumerates 244 species.)

KENT.

Boys (Wm.)—[The Birds of Sandwich and the Neighbourhood.] In his *Collections for a History of Sandwich*, pp. 849-854. Canterbury, 4to, 1792.

Collingwood (Cuthbert) and others.—The Fauna of Blackheath and its Vicinity. By the Geological Committee of the Greenwich Natural History Club. London, 8vo, 1859. (A very poor production, containing some astounding errors.)

Dowker (Geo.)—A Tabulated List and Description of the Birds of East Kent, with Anecdotes [&c.] London, 8vo, 1889. (Very imperfect.)

Ullyet (Hy.)—List of Folkestone Birds. (Not seen; mentioned in Dowker's *Birds of East Kent*, p. 4.)

LANCASHIRE.

Leigh (Chas., M.D.)—The Natural History of Lancashire, Cheshire and the Peak in Derbyshire, &c. Oxford, fo., 1700.

Rylands (Peter)—Catalogue of Birds found in Lancashire. *The Naturalist* (Neville Wood's), vol. ii., p. 349-357. London, 8vo, 1837.

Byerley (Isaac)—The Fauna of Liverpool. London, 8vo, 1854. (Enumerates 195 species of birds, which occupy pp. 10-23.)

McNicholl (D. H.)—The Birds of Southport. In his *Handbook for Southport*, 2nd Edition, pp. 79-96. London, 8vo, 1861. (Enumerates about 130 species.)

Harting (J. E.)—The Birds of Walney Island. *The Zoologist*, vol. xxii., pp. 9156-9165, and vol. xxii., pp. 9408-9411. London, 8vo, 1864 and 1865.

Smith (Henry Ecroyd)—The Birds of the Mersey District. In his *Notabilia of the Mersey District*, pp. 47-66. Liverpool, 8vo, 1867.

Durnford (W. A.)—List of Birds found in the Neighbourhood of Walney Island, with Notes. Pp. 1-20. Barnsley, 8vo, 1883. (Enumerates 188 species.)

Mitchell (F. S.)—The Birds of Lancashire. London, 8vo, 1885. (Enumerates 256 species.)

Howard, Mitchell and others. (MESSRS.)—A List of the Birds of Stonyhurst. *The Stonyhurst Mag.*, July, 1888. Stonyhurst, 8vo, 1888. (Not seen; enumerates 162 species.)

LEICESTERSHIRE.

Harley (Jas.)—A List of the Birds of Leicestershire. In Macgillivray's *British Birds*, vol. iii. London, 8vo, 1840.

Babington (REV. CHURCHILL)—The Ornithology of Charnwood Forest (also Supplement). In T. R. Potter's *History of Charnwood Forest*, App., pp. 65-70 and 73. London, 4to, 1842.

Browne (Montagu)—The Vertebrate Animals of Leicestershire. *The Zoologist*, 3rd series, vol. ix., pp. 161, &c. London, 8vo, 1885.

———The Vertebrate Animals of Leicestershire and Rutland. Birmingham, 4to, 1889. (Birds, pp. 39-172.)

LINCOLNSHIRE.

Cordeaux (John)—Birds of the Humber District. London, 8vo, 1872. (Enumerates 276 species.)

Miller (S. H.) and Skertchley (S. B. J.)—Birds of the Fen-land. *The Fen-land: Past and Present*, pp. 362-388. London, 8vo, 1878. (Enumerates 244 species.)

MIDDLESEX.

Torre (H. J.)—A List of Birds found in Middlesex. *The Naturalist* (Neville Wood's), vol. iii., p. 420. London, 8vo, 1838.

Bridgeman (HON. F. C. and HON. G. O. M.)—Notices of the Birds of the Neighbourhood of Harrow. In J. C. Melvill's *Flora of Harrow*. London and Harrow, 8vo, 1864. (Enumerates 225 species.)

Power (F. D.)—A List of Birds noticed in London during 1863-64. *The Zoologist*, vol. xxiii., pp. 9727-9728. London, 8vo, 1865.

Harting (J. E.)—The Birds of Middlesex. Pp. i.-xvi., 1-284. London, 8vo, 1866. (Enumerates 225 species.)

A[dams (A. Leith)]—Birds of London. *The Field*, Jan. 16th and 23rd, 1875. London, fo., 1875.

Hamilton (Ed.)—The Rooks and Rookeries of London, Past and Present. *The Zoologist*, 3rd series, vol. ii., pp. 193-199. London, 8vo, 1878.

Newton (PROF. A.)—The Rooks and Rookeries of London. *The Zoologist*, 3rd series, vol. ii., pp. 441-444. London, 8vo, 1878.

Harting (J. E.)—The Færa Naturæ of the London Parks, [including the Birds.] *Pop. Sci. Review*, new ser., vol. x., pp. 163-172. London, 8vo, 1879. (Reprinted in this Author's *Essays on Sport & Natural History*, pp. 229-247. London, 8vo, 1883.)

Hamilton (Edw.)—The Birds of London; Past and Present, Residents and Casuals. *The Zoologist*, 3rd series, vol. iii., p. 273-291. London, 8vo, 1879.

Pigott (T. Digby)—London Birds and London Insects. (Birds, pp. 1-28.) London, 8vo, 1884.

Harting (J. E.)—Bird-Life in Kensington Gardens. *The Field*, Jan. 14th, 1888.

Harting (J. E.)—The Birds of Hampstead Hill. In J. L. Lobley's *Hampstead Hill: its Structure, Materials, and Sculpturing* [&c.], pp. 86-99. London, 4to, 1889.

Hamilton, (Edw.)—[The Wild Birds of London.] *Murray's Magazine*, May, 1889. London, 8vo, 1889. (Enumerates 93 species.)

NORFOLK.

Browne (Sir Thos.)—An Account of the Birds found in Norfolk, 1682. *Wilkin's edition of Sir Thos. Browne's Works*, vol. iv., pp. 313-324. London, 8vo, 1835.

Sheppard (Rev. Revett) and Whitear (Rev. Wm.)—A Catalogue of Norfolk and Suffolk Birds, with Remarks. In *Trans. Linn. Soc.*, vol. xv., p. 1-62. London, 4to, 1826.

———Ein Catalog der Vögel in Norfolk und Suffolk. Oken's *Isis*, bd. xxii., pp. 1089-1097. 1829. (Translated from *Trans. Linn. Soc.*, vol. xv., p. 1-62, 1826.)

Hunt (John)—A List of [the] Birds of Norfolk. In [J. Chambers's] *General History of the County of Norfolk* [&c.], vol. i., pp. lix-lxxii. Norwich and London, 12mo, 1829. (A very fair list, including a large number of species.)

Paget (C. J. and J.)—Sketch of the Natural History of Yarmouth and its neighbourhood, containing Catalogues of the Species of Animals, Birds, Reptiles, Fish, Insects and Plants at present known, pp. i-xxxii; 1-88. Yarmouth, 8vo, 1834.

Gurney (J. H.) and Fisher (W. R.)—An Account of the Birds found in Norfolk, [&c.] *The Zoologist*, vol. iv., pp. 1300 and 1373. London, 8vo, 1846. (Also reprinted separately.)

Lowne (B. T.)—The Natural History of Yarmouth. Appendix to Chapter V., List of Birds, pp. 56-61. London, 8vo, 1863. (Practically a 2nd edition of Paget's *Nat. Hist. of Yarmouth*.)

Stevenson (Hy.)—A List of the Birds of Norfolk, with Remarks on the General Ornithology of the County. In White's *History and Directory of Norfolk*. Sheffield, 8vo, 1864. (Also reprinted separately, pp. 1-10, and again with alterations in *The Zoologist*, vol. xxii., pp. 9025-9036; enumerates 293 species; there are also later editions.)

Lubbock (Rev. R.)—Observations on the Fauna of Norfolk, and more particularly on the District of the Broads. Norwich, 8vo, 1845. (Second edition, Norwich, 8vo, 1879.)

Stevenson (Hy.)—The Birds of Norfolk, with remarks on their Habits, Migration and Local Distribution, 3 vols. London and Norwich, 8vo, 1866-70-[90.] (Third vol. now in the press.)

Hunt (A. Leigh)—The Birds of Thetford. In *The Capital of the Ancient Kingdom of East Anglia*, pp. 225-235. London, 8vo, 1870.

Stevenson (Hy.)—Ornithology of Norfolk. In White's *History, Gazetteer and Directory of Norfolk*, 4th ed. Sheffield, 8vo, 1883. (Enumerates 293 species.)

Gurney (J. H.)—A Catalogue of the Birds of Norfolk. In R. H. Mason's *History of Norfolk*. London, 4to, 1884. (Also reprinted separately; "additions and corrections" up to December, 1885, have been issued; enumerates about 290 species.)

Gurney (J. H.) and Southwell (Thomas)—List of Norfolk Birds. *Trans. Norf. & Norwich Nat. Hist. Soc.*, vol. iv, pp. 259 & 397. Norwich, 8vo, 1887.

NORTHAMPTONSHIRE.

Lilford (T. L. Powys, Lord.)—Notes on the Birds of Northamptonshire. *Journ. Northamptonshire Nat. Hist. Soc.* Northampton, 8vo, 1880-83. (Only vol. i., as far as Wryneck, as yet published; also reprinted separately for private circulation.)

NORTHUMBERLAND.

Wallis (John)—[The Birds of Northumberland]. In *The Natural History of Northumberland*, vol. i., pp. 909-346. London, 4to, 1769. (Enumerates about 50 species.)

Selby (P. J.)—Catalogue of the various Birds which at present inhabit or resort to the Farne Islands, with observations, [&c.] *The Zoological Journal*, vol. ii., pp. 454-465. London, 8vo, 1826.

Lesson (R. P.)—Catalogue de divers Oiseaux qui appartiennent à la Faune des Iles Farne, by P. J. Selby, *Férrus. Bull.*, 2nd ser., vol. xiii., p. 433. Paris, 8vo, 1828. (Translated from the above.)

Selby (P. J.)—A Catalogue of Birds hitherto met with in the Counties of Northumberland and Durham. In *Trans. Nat. Hist. Soc. Northumb. Durh. and Newcastle-on-Tyne*, vol. i., pp. 244-290. Newcastle, 4to, 1831. (Enumerates 214 species.)

———The Fauna of Twizell. *Mag. Zool. and Bot.*, vol. ii., pp. 387-397. Edinburgh and London, 8vo, 1838. (Treats of Birds only, and enumerates 112 species.)

Embleton (Robert C.) [The Birds of the Alnwick District]. In Geo. Tate's *History of the Borough, Castle and Barony of Alnwick*, vol. ii., pp. 438-440. Alnwick, 8vo, 1866-69. (Enumerates 181 species, without any comments.)

Hancock (John)—A Catalogue of the Birds of Northumberland and Durham. In *Nat. Hist. Trans. Northumberland and Durham*, vol. vi., xxx. and 177 pp. London and Newcastle-on-Tyne, 8vo, 1874. (Enumerates 265 species.)

Gurney (J. H.)—Notes on the Farne Islands and some of the Birds which are found there. *Proc. Nat. Hist. Soc. of Glasgow*, vol. iii., pp. 268-278. Glasgow, 8vo, 1878.

Clarke (Wm. Eagle)—Bird-life at the Farne Islands. In *The Naturalist (Y.N.U.)*, Jan. 1881. (Also separately reprinted, Huddersfield, 8vo, 1881.)

Lebour (Prof. G. A.)—Handbook to the Geology and Natural History of Northumberland and Durham. [Including Birds.] *Brit. Assoc. Handbook*. Newcastle-on-Tyne, 1889. (Not seen.)

NOTTINGHAMSHIRE.

Felkin (W. JUN.)—The Ornithology of Nottinghamshire. In *Allen's Illustrated Handbook and Guide to Nottingham and its Environs*, pp. 44-58. Nottingham and London, 8vo, 1866. (Enumerates 229 species.)

Sterland (W. J.)—The Birds of Sherwood Forest, with notes on their Habits, Nesting, Migrations, &c. London, 8vo, 1869.

Sterland (W. J.) and Whittaker (J.)—Descriptive List of the Birds of Nottinghamshire. Mansfield, 8vo, 1879.

OXFORDSHIRE.

Plot (Robt.)—The Natural History of Oxfordshire. Oxford, fol., 1705.

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MEMOIR OF THE LATE W. S. DALLAS, F.L.S.

THE news of the unexpected death of William Sweetland Dallas has caused a pang of wide-spread regret far beyond the pale of the Society in which he was best known, and in which, for two-and-twenty years, he ably discharged the duties of Assistant Secretary. Not only has the Geological Society lost the valued services of one whom it will be very difficult to replace, but very many workers in Zoology as well as Geology who have been accustomed to seek his aid and advice, will feel that in him they have lost a good friend. His attainments were of no mean order. His knowledge of modern languages was considerable, and his acquaintance with the general literature of the subjects to which he was especially devoted, coupled with the experience which he had acquired as Editor of two important periodicals, caused him to be regarded with respect and esteem by all who knew him.

Mr. Dallas had not yet reached the allotted age of three-score-years-and-ten when death overtook him. He was born in 1824, and was the youngest son of Mr. William Dallas, of Lloyd's, who died in 1836. Educated at University College School, he evinced from the first a taste for Natural History, and spent much of his early life in the Insect Room of the British Museum, where he received much encouragement in his studies from the late Dr. J. E. Gray, who was then the Keeper of the Zoological Department. Entomology was his favourite science, and his zeal in pursuit of it may be judged from the fact that he took the trouble, when a young man, to transcribe the whole of the '*Entomologia Systematica*' of Fabricius (a work in four vols. of between two and three thousand octavo pages), to which he added a coloured figure of the type-species in each genus, either from nature or from some approved authority.

So early as 1847 he began to contribute papers to the '*Transactions of the Entomological Society of London*,' and in 1851 commenced the preparation of a '*List of the Hemipterous Insects in the Collection of the British Museum*,' which he completed the following year. In 1854-55, he published in Orr's '*Circle of the Sciences*' a series of articles on the habits, structure, and classification of animals, which he afterwards

collected in one volume entitled 'A Natural History of the Animal Kingdom,' and published in 1856.

His 'Elements of Entomology,' published by Van Voorst in 1857, an octavo volume of more than 400 pages, was a work of considerable utility at the date of its appearance, and showed how untiring was the author's zeal in pursuit of his hobby.

As a translator he was equally industrious, and English zoologists are indebted to him for the following useful translations:—Von Siebold's work on 'Parthenogenesis in Moths and Bees,' 1857; vol. v. of Humboldt's 'Cosmos,' for Bohn's Scientific Series, 1858; Nitzsch's 'Pterylography,' for the Ray Society, 1867; Fritz Müller's 'Facts and Arguments for Darwin,' 1869; Prof. Heer's 'Primeval World of Switzerland,' 1876; and Buchner's 'Man, Past and Present.' In addition, he translated numerous foreign articles for the 'Annals and Magazine of Natural History,' the 'Chemical Gazette,' 'Philosophical Magazine,' and other periodicals, to which he also occasionally found time to contribute original papers of his own.

His early work at the British Museum helped to qualify him for the Curatorship of the Yorkshire Philosophical Society's Museum, in York, to which post he was appointed in 1858, on the resignation of Mr. Edward Charlesworth. Here he remained until 1868, when, on the retirement of Mr. H. M. Jenkins, he succeeded him as Assistant Secretary and Librarian to the Geological Society of London, a position which he held with great credit to himself and advantage to the Society until his death. From the date of his appointment he appeared to work harder than ever, having to edit the Quarterly Journal of the Geological Society, and his leisure hours, after the official work of the day was ended, were fully occupied. Between the years 1877 and 1883, he materially assisted Prof. Martin Duncan in editing Cassell's 'Natural History' (six vols. 4to), to which he contributed the articles Chiroptera, Insectivora, Rodentia, Hymenoptera, Neuroptera, Diptera, Aphaniptera, Rhynchota, Orthoptera, Thysanura, Myriopoda, and Arachnida. He was one of the Editors of the 'Annals and Magazine of Natural History' from 1868 to 1890, and from 1877 to 1880 edited the 'Popular Science Review.'

He was elected a Fellow of the Linnean Society in 1849, and for a long time took an active interest in its proceedings, serving

on the Council, and on the Library Committee, attending the meetings, and taking part in the discussions. But of late signs were not wanting of a lack of the old energy. Premonitory symptoms of paralysis unfortunately appeared, and fatally brought to a close, on the 28th May last, a long and most useful scientific career.

Mr. Dallas married, in 1850, a daughter of Mr. Liscombe Price, of Abergavenny, by whom he has left two daughters and four sons, one of whom is worthily following in his father's footsteps as a naturalist in the Albert Memorial Museum at Exeter.

NOTES AND QUERIES.

BIRDS.

Erroneous Record of the Gull-billed Tern in Ireland.—Mr. Robert Patterson, of Belfast, has forwarded for my inspection an immature specimen of the Arctic Tern, *Sterna macrura*, Naum., which is, as he informs me, the identical bird which was recorded by Prof. Cunningham as a Gull-billed Tern (*S. anglica*, Mont.), in 'The Zoologist' for 1887, p. 433. Inasmuch as, trusting to Prof. Cunningham's determination, I inserted this record in my 'Manual of British Birds,' p. 623, I shall be obliged by the publication of this correction.—HOWARD SAUNDERS.

Nesting Habits of the Sky Lark.—Though I cannot profess to offer a complete answer to Mr. Laws' inquiries (Zool. 223), yet a few observations of mine may perhaps throw some light on the subject. I have from time to time found some dozen nests of the Sky Lark, and yet in no case have I seen five eggs, four being the most usual number, and three quite common. Probably with the Sky Lark, as well as with other birds, the number of eggs varies slightly according to locality and season. The period of incubation may very well be shorter than is generally supposed, and the matter is worth looking into. Most small birds sit for about a fortnight, but, from a large number of observations, I am convinced that the Chaffinch for one only broods for eleven days, and it may well be that the period in the case of others is equally short. The Thrush and Blackbird, I find, incubate for exactly fourteen days. Other instances, also, of variation in number may be quoted. Yarrell, Seebohm, and all other writers on Ornithology whom I have consulted, give the Yellow Bunting credit for laying five eggs; but certainly in the Co. Wicklow, where my experience mostly lies, it does not. Probably I have examined hundreds of Yellow-

hammers' nests in different years, and yet I have only once seen a nest containing five eggs; very rarely have I seen clutches of four, three being usual, and two quite as common. The same writers assign five as the usual number of eggs for the Chaffinch. Seebohm says four to six. Now in Wicklow the Chaffinch very rarely lays five eggs; four is the usual clutch, and three often occurs, and there is generally but one brood. The Chaffinch and Yellowhammer are perhaps our two commonest birds; conditions must therefore be very favourable for their increase. In such specially favourable districts it may possibly be that Nature maintains the balance by diminishing the number of eggs. It would certainly be absurd to suppose that the best writers have all erred on a simple matter of field observation. On a point such as the duration of the period of incubation, it is quite possible that good authorities may fall into mistakes by copying the mis-statements of their forerunners, as it requires repeated and tedious observations before any certain conclusion can be independently arrived at in this matter.—ALLAN ELLISON (Trinity College, Dublin).

Nesting Habits of the Sky Lark.—The communication under this heading, in 'The Zoologist' for June, was of considerable interest to me, as I had a similar experience in the spring of 1889. I was then in a district of Peeblesshire where Sky Larks are numerous, and had an opportunity of examining a good many of their nests—eight or nine in all. Like your correspondent Mr. Laws, I always considered five to be the normal number of eggs laid by the Sky Lark, and was therefore somewhat surprised to find three eggs only in each of the nests that came under my notice. In order to test whether three was to be the full complement of eggs laid at that time, I marked a few of the nests, and visited them occasionally until the young were hatched out, and in no case were any additional eggs laid. In the same district, in previous years, four or five eggs were usually to be found in the nests, and I could find no reason for the difference in the number laid in the season referred to. I hope some one else may be able to give an explanation.—T. G. LAIDLAW (9, South St. Andrew Street, Edinburgh).

Cirl Bunting nesting near Brecon.—On June 4th I took a Cirl Bunting's nest and four eggs on a hill-side close to Brecon. I had a good view of the female sitting on the nest, on three separate occasions, and was able to identify her positively as a Cirl Bunting. The nest was in a gorse bush, about a foot from the ground, and the eggs are handsomely and boldly marked with nearly black streaks on a greenish white ground. I was desirous of obtaining one of the birds to add to the interest attached to the eggs, and succeeded in shooting a male Cirl Bunting a few days later near the site of the nest. Having become acquainted with the song of this bird, I have been able to identify another male of this species near the same place. It seems to me its song is so like that of the Lesser White-

throat that it might be easily overlooked. The fact of the nesting of the Cirl Bunting in Wales has not, I believe, been before recorded, therefore these particulars may be of interest. — E. A. SWAINSON (Woodlands, Brecon).

Hermaphrodite Finch.—At a recent meeting of the Royal Academy of Sciences, Amsterdam, Herr Max Weber exhibited a hermaphrodite Chaffinch, *Fringilla caelebs*, which had been caught in the neighbourhood of Amsterdam. The right side of the bird had the plumage of the adult male, the left side that of the adult female, and this striking difference in the external coloration of the two sides was found to correspond with the internal structure, there being an ovary on the female side and a testis on that of the male; thus illustrating the dependence of sexual colouring upon the nature of the sexual gland.—J. E. HARTING.

Wood Wren in Co. Wicklow.—On May 31st, when in company with Mr. A. Friel and Mr. Anton (Lord Powerscourt's head keeper), I had the pleasure of seeing and hearing this little bird. We found it in the deer-park, Powerscourt, very near the spot where two years ago Mr. Anton, at my request, shot the specimen now in the Dublin Museum. On June 5th I heard two other Wood Wrens singing in Derrybawn Wood, near the Seven Churches. These are the only instances I know of its occurrence in Ireland lately. Mr. Allan Ellison and Mr. J. Johnston are indefatigable in their quest of birds in Co. Wicklow, and Mr. Patten in preserving any specimens obtained. A number of young and ardent ornithologists are now investigating the avifauna of this county, where Mr. R. M. Barrington has laboured so long and so successfully.—CHARLES W. BENSON (Elm Park, Ranelagh, Dublin).

Wood Wren in Co. Mayo.—I have just received from Mr. Richard Widdicombe, Lightkeeper at Blackrock, Co. Mayo, a Wood Wren, shot there on May 27th. Blackrock is situated about six miles N.W. of Achill Head, and is a small island, with very scanty vegetation, over which the spray dashes in stormy weather. This is the first occurrence which has been reported of the Wood Wren on migration at any Irish lighthouse, and extends the range of this very rare visitor to the extreme west.—RICHARD M. BARRINGTON (Fassaroe, Bray).

Note on the American Killdeer Plover shot at Christchurch, Hants.—The late Mr. Wise, in his 'History of the New Forest,' has stated that a Killdeer Plover, *Ægialitis vocifera*, was shot at Knapp Mills, Christchurch, in April, 1859. Mr. Howard Saunders, in his 'Illustrated Manual of British Birds' (p. 529), by some occult reasoning, doubts the accuracy of this statement, and gives the date April, 1857. Had he made proper enquiry, however, he would have found not only that Tom Dowden (not "Dowding," as printed by Mr. Wise) killed the bird at the place

stated, but also that there were witnesses to the fact. Dowden and three other keepers were fishing the weir pool, when the bird in question attracted their attention. Dowden pushed across to the Fish-House for his gun, and shot it from that place. No one here could name the bird, although it was shown to many persons, and private libraries were searched in vain for some figure or description. Owing, however, to the interest taken in the matter by the late Earl of Malmesbury, it was ultimately correctly identified. It was purchased at the time by Mr. Tanner, who rented part of the water here, and who had every opportunity to hear from the keepers the facts of the occurrence. In January, 1884, Mr. Saunders wrote me, "About the Killdeer Plover I have no personal doubt whatever but that it was a genuine Hants-killed specimen, but the chain of evidence was not sufficiently perfect to justify its insertion in the British list." This was of the least importance, whether a single straggler to this country should be included in this list. I could have sent Mr. Saunders a letter that would have removed any doubt, had I known sooner that such existed in his mind. I have sought out all the persons now living who either saw the bird (as I did) in the flesh; or who could have given evidence respecting its capture; but not one single enquiry at any time has been made of them, thus placing at its true value Mr. Saunders' "later investigation." His reflection upon those chiefly concerned, in a matter of local history, I cannot let pass without a protest, considering that no author should publish a statement without being able to produce some evidence to substantiate it.—EDWARD HART (Christchurch, Hants).

[As we understand the case, Mr. Saunders abstained from endorsing the statement that the bird in question was killed near Christchurch, being unable to produce evidence to substantiate it, although, as Mr. Hart now remarks, a little further enquiry might have elicited all the facts. This is not the only instance in which this American Plover has occurred in England. A second specimen was procured by Mr. Jenkinson, as our readers may recollect, at Trescoe, in the Scilly Islands, in January, 1885. See 'Zoologist,' 1885, p. 113.—ED.]

Ornithological Notes from Mayo and Sligo.—As usual the Sandwich Terns, *Sterna cantiaca*, were the first of our summer visitors to arrive. One was observed on March 15th, but the main flight were not seen until the 24th and 25th of that month. These birds, I am glad to say, are steadily increasing in numbers, owing to their breeding-ground on Rath-rooyeen Lough being strictly preserved by the owner, Sir C. Knox-Gore, who does not allow them to be disturbed by visitors, or any eggs taken. The next species to appear was the Willow Wren, on April 19th; then a Swallow was seen on the 22nd, and some Whimbrels, *Numenius phæopus*, on the 30th. A Common Tern was seen on May 1st, and the Cuckoo and Corn Crake heard on the 5th, Whitethroats on the 12th, and the Spotted

Flycatcher on the 23rd. Although we had such very fine weather during the migratory season, so favourable for the passage of the smaller birds, yet most of them are scarcer than I ever remember in this neighbourhood. Willow Wrens and Whitethroats, usually so common in all our plantations and hedgerows, are very few indeed; and this is the second season that I have missed the cheerful notes of the Chiffchaff from the trees around. I have seen only one pair of Spotted Flycatchers, although in other seasons I used to observe four or five pairs near the house and garden. On May 1st I went down the river to Bartragh, seeing very few waders. Small parties of Godwits (all in winter dress) and Curlews were on the sands, and I noticed about thirty pairs of Sandwich Terns, but only one Common Tern was in sight. Eight Red-throated Divers, *Colymbus septentrionalis*, were in the Channel near the Bar, only five birds exhibiting summer plumage; they were very wild, and on the approach of my punt all went outside into the broken water of the bay. On May 18th I observed a Richardson's Skua chasing the Terns on the river: this bird was in the black plumage, and was evidently resting here on its way to the northern breeding-grounds. Generally during May a pair of these Skuas are seen about, but only remain for ten or twelve days. I went with some friends, on June 6th to visit Lough Talt,—a little lake in the heart of the Ox Mountains, Co. Sligo, about twelve miles from the sea,—and I was surprised to see a pair of Ringed Plovers with a young bird just able to fly, on the gravelly shores of the lake. A pair of Dunlins, in full summer plumage, were also on the shore, and, after remaining for some time, one bird flew off to a small boggy flat on the side of the mountain, where I have no doubt it had its nest. There were three pairs of the Common Sandpiper about, but we were unable to find their nests or young ones. Wheatears were very numerous about the stony shore, and we found a young one under a large rock, and the nest of a Twite with five eggs on a heathy bank, well sheltered by a bunch of heather. Ring Ouzels also frequent the rocky parts of the mountain surrounding the lake. Some years ago I discovered the Common Gull, *Larus canus*, nesting on a small rocky island in this lake; but although I was too late for the eggs, I found young birds fully fledged, and an addled egg in a nest on the island; but unfortunately the Gulls have long since deserted this breeding-haunt, in consequence of the number of boats placed on the lake for the trout-fishing in May, thereby disturbing the birds just when they are settling down to their nests.—ROBERT WARREN (Moy View, Ballina).

The Siskin breeding in Ireland.—As I believe that some have doubted the fact that the Siskin breeds in Ireland, I wish to mention that on Saturday, May 24th, on the invitation of Mr. James Johnston, I went with him and some other friends to the Deer Park, near Powerscourt Waterfall. There we heard several Siskins, and, on arriving at the tree

where Mr. Johnston had observed the nest, one of our party climbed the larch, the hen bird remaining on the nest almost till he reached it, when she flew off to a tree hard by. Four young were in the nest, but, as we were anxious that they should not be disturbed, our friend quickly descended. No sooner had he left the tree than I saw the female return, and again sit upon the young; and shortly after I heard the plaintive call-note of the cock bird, and saw him very distinctly as he approached the nest, and evidently fed the female as she sat upon the young. Not far distant we found a pair of Stock Doves, which I believe are breeding near the Castle Rock; and above them saw a Kestrel closely pursued by a Ring Ousel, which dashed at him whenever he ventured to alight near the summit. These woods afford opportunities to ornithologists almost unrivalled in Ireland,—Crossbills, Redstarts, and Wood Warblers having been found in the neighbourhood,—and no one is, I think, more competent to show would-be observers all that is to be seen than my friend Mr. James Johnston, of Novara, Bray, a most ardent ornithologist, who spends the greater part of his time in these cool and delightful summer retreats.—CHARLES W. BENSON (Rathmines School, Dublin).

Montagu's Harrier in Wexford.—An adult male of this species was shot on May 14th at Balafad, near Croaghan Mountain. This is, I believe, the first occurrence of this bird in mature plumage in Ireland, the three previous examples obtained having been all in the immature brown plumage. The stomach of this specimen was filled with the remains of a Sky Lark.—EDWARD WILLIAMS (Dame Street, Dublin).

Manx Shearwater on the Saltee Islands.—On May 18th, 1889, I visited the Saltee Islands, Co. Wexford, in company with Lieut. J. G. Millais, and we discovered a small colony of Manx Shearwaters breeding on the South Island. Two eggs were taken. As many have searched in vain for this species breeding on the Saltees, it may be worth mentioning. On the North Island I believe the Shearwater also breeds, and probably in larger numbers, but not having been on it after nightfall I could not ascertain this with certainty. My first visit to the Saltees was in May, 1885, and at that time the Puffins were extremely numerous. In 1889 they had greatly decreased, there being scarcely a third of the number, while other species were about the same.—RICHARD M. BARRINGTON.

Black Terns in Co. Wicklow.—On May 24th last I saw a little flock of eight or ten Black Terns, *Sterna nigra*, on the Brittas Ponds, about six miles from Blessington, Co. Wicklow.—E. WILLIAMS (Dame St., Dublin).

Note on the Turnstone.—The Turnstone (*Streptilas interpres*) may be said to be the last of the shore-birds to depart, and the first to return. Its

name is derived from its well-known habit of displacing small stones and *débris* that shelter sand-hoppers and other Crustaceans. This is accomplished with its beak, which is of great strength and of a conical form, pointing upward rather than downward. The narration of a circumstance, witnessed by Mr. James Mitchell and myself, will serve to illustrate the extraordinary strength of the Turnstone's mandibles, and to show that several birds, working in concert, and with a common aim, can accomplish feats which would be beyond the strength of an unaided individual. The scene occurred on the sandy shore opposite the "Black Dog," on the north side of Don-mouth, when Mr. Mitchell and I were returning from the River Ythan, where we had gone in quest of a *rara avis* that had been reported the previous day. It was one of those sunny noons in August that make existence itself a luxury,—everything around us seemed bathed in delight,—and our thoughts were so elevated that nothing short of the great object of our excursion would have tempted us to fire a shot. The sky was at its unclouded best; the sun was clear and hot; and the whitish breakers that fringed the sea danced miniature rainbows of opalescent hues. The tide had begun to ebb, and we concealed ourselves among the bents, expecting that our prey might turn up with the return of the birds that had been driven from their feeding-ground by the flow. We had not long enjoyed our sun-bath, when a flock of Turnstones alighted so near us that, even without the aid of a binocular-glass, we could distinctly see their movements. The birds gradually focussed themselves upon a dead salmon that was partially embedded in the sand. They speedily removed the sand from the fish, until the tail only remained covered, and those upon the lower side continued digging under the fish, while those upon the upper side kept pressing it upward, till they succeeded in overturning it. The fish fell upon some of the birds that were undermining it. Two, in a rather excited manner, managed to free themselves and escape; and my dog, "Clyde," one of the gentlest creatures that ever carried a bird, ran in and caught another that was all but concealed by the fish. "Clyde" was in a playful mood; and having of her own accord secured the bird, she was hardly in a humour to give it up.—W. C. ANGUS ('Proc. N. H. Soc. Glasgow,' 1890, p. 180).

[This account reminds us of an observation made on the actions of a pair of Turnstones, by the late Thomas Edward, of Banff, published in Smiles' 'Life of a Scotch Naturalist,' p. 243, which is worth reading.—ED.]

MOLLUSCA.

On the Position of the Dart-sac in *Helix rufescens*.—*Helix rufescens* possesses a double bilobed sac, two lobes on each side of the vagina. The

upper ones are empty, the darts being situated in the lower and larger lobes. These lobes are pyriform and nearly transparent, the upper ones being often ringed with minute spots of a chocolate-brown colour. The situation of the sac is such as does not occur in any other species of dart-bearing snail, being in some cases quite 5 mm. from the genital orifice. Now the dart of this species is about 1.25 mm. in length, and presuming that the dart-sac, when inverted, together with the dart, measures 4 mm., it will be seen that it is quite impossible for this mollusk to use its weapon. I have dissected them at all times of the year, but have never met with a specimen in which the darts were absent. I have also carefully watched them uniting, but have never witnessed the use of the darts. I am aware that owing to the small size of the organ it is quite possible that it might be overlooked; but from the numerous experiments I have made, extending as they do over three years, I feel sure I should have seen it, at one time or another, had it been used. It would appear then that this species of *Helix*, although possessing the darts, is incapable of using them. If this be so, it is, I think, a strong point in favour of the theory I advanced some three years ago as to their use—viz., that they are degenerate weapons of defence, and that in the past they were much stronger and oftener-used organs. It would be interesting to know whether species possessing two darts—viz., *H. ericetorum*, *H. hispida*, and *H. concinna*—ever use both in one encounter. I have never seen both used, but it is very likely that this happens in prolonged encounters.—W. E. COLLINGE (Hon. Assistant Curator, Conchological Soc. Gt. Brit., Leeds).

SCIENTIFIC SOCIETIES.

LINNEAN SOCIETY OF LONDON.

May 24, 1890, *Anniversary Meeting*. — Mr. W. CARRUTHERS, F.R.S., President, in the chair.

Messrs. W. West, J. B. Carruthers, and J. Sidney Turner were admitted Fellows.

The Treasurer presented his Annual Report, duly audited; and the Secretary having announced the elections and deaths of Fellows during the past year, the President proceeded to deliver his Annual Address. In this he dealt with the distribution of British plants both before and after the Glacial Period (making special allusion to the discoveries of Mr. Clement Reid amongst the vegetation of the Cromer Forest Bed), and showed that the forms which have come down to us at the present

day do not differ in any respect from the same species found in the Glacial beds.

A vote of thanks was moved by Sir Joseph Hooker, and seconded by Mr. Stainton, to the President for his excellent Address, with a request that he would allow it to be printed, and was carried unanimously.

On a ballot taking place for new Members of Council, the following were declared to be elected:—Dr. P. H. Carpenter, Dr. J. W. Meiklejohn, Mr. E. B. Poulton, Dr. D. Sharp, and Prof. C. Stewart.

On a ballot taking place for President and Officers, the following were declared to be elected:—President, Prof. Charles Stewart; Secretaries, B. D. Jackson and W. P. Sladen; and Treasurer, Frank Crisp.

The Linnean Society's Gold Medal for the year 1890 was then formally awarded, and presented to Prof. Huxley for his researches in Zoology.

June 5.—Prof. CHARLES STEWART, President, in the chair.

Messrs. Harvey Gibson and W. F. Kirby were admitted, and Messrs. W. H. Beeby and S. Gasking were elected Fellows of the Society.

The President then nominated as Vice-Presidents for the year, Messrs. W. Carruthers, P. Martin Duncan, J. G. Baker, and F. Crisp.

Mr. H. Little exhibited and made some remarks upon a photograph of a remarkable Aroid, *Amorphophallus titanum*, which had flowered for the first time in this country.

Mr. James Groves exhibited a specimen of an *Orobanche* parasitic upon a *Pelargonium*.

The following papers were then read and discussed:—(1) Mr. G. F. Scott Elliott, On a collection of plants made by him in Madagascar; (2) Rev. G. Henslow, On Weismann's theory of heredity applied to plants; (3) Prof. Windle, Teratological evidence as to heredity of acquired conditions; (4) Mr. Harvey Gibson, On the development of the tetrasporangia in *Rhabdochorton Rothii*, Naegeli; (5) On the position of *Chantransia*, with a description of a new species, by Mr. George Murray and Miss E. Barton; (6) Miss A. L. Smith, On the development of the cystocarp in *Callophyllis laciniata*; and (7) Mr. J. B. Carruthers, On the cystocarps of some genera of Floridææ.

ZOOLOGICAL SOCIETY OF LONDON.

June 3, 1890.—Prof. W. H. FLOWER, C.B., LL.D., F.R.S., President, in the chair.

The Secretary read a Report on the additions that had been made to the Society's Menagerie during the month of May, 1890, and called special attention to a pair of Hartebeests, *Alcelaphus caama*, and a pair of Swainson's Long-tailed Jays, *Calocitta formosa*, acquired by purchase; and

to a pair of Beatrix Antelopes, *Oryx beatrix*, presented by Col. E. C. Ross, Consul-General for the Persian Gulf.

Mr. Sclater exhibited and made remarks on two young specimens of Darwin's Rhea, *Rhea darwini*, obtained by Mr. A. A. Lane in the province of Tarapacá, Northern Chili, and forwarded to Mr. H. H. James.

Mr. Sclater exhibited and made remarks on a flat skin of a Zebra, received from Northern Somaliland, which appeared to be referable to Grévy's Zebra, *Equus grevyi*.

Mr. A. D. Michael read a paper on a collection of non-parasitic *Acarina* lately made in Algeria, where he had found the *Acarina* less abundant than in England, and, indeed, almost absent from the true southern vegetation. The species met with were not of larger size than the British. The collection consisted almost entirely of Oribatidæ, and contained examples of 46 species belonging to 15 genera. Amongst them were 8 species new to science, 27 were British, and the rest South European. Amongst the new species were a remarkable new *Caculus*, there being previously only one known species of this curious genus, which forms a separate family. There was also a new *Notaspis*, which had not been found in Europe, but had been received from the shores of Lake Winnipeg, in Canada. There were likewise some very singular new species of the genus *Damaeus*, and a triple-clawed form of *Nothrus anauniensis*.

Mr. Frank E. Beddard read a paper on the anatomy of the Fin-foot, *Podica senegalensis*. The paper dealt chiefly with the myology and osteology of this doubtful form. The conclusion arrived at was that it showed most resemblance to the Rails, but that in its muscular anatomy it agreed in many particulars with the Grebes and Divers.

Mr. O. Thomas read some notes on the specimens of Mammals obtained by Dr. Emin Pasha, C.M.Z.S., during his recent journey through Eastern Africa, as exemplified in the specimens contained in two collections presented to the British Museum and the Zoological Society respectively.

Mr. G. A. Boulenger read a paper containing the descriptions of two new species of the Siluroid genus *Arges*, from South America.

A communication was read from Mr. James Yate Johnson, containing descriptions of five new species of fishes from Madeira.—P. L. SCLATER, Secretary.

ENTOMOLOGICAL SOCIETY OF LONDON.

June 4, 1890.—The Right Hon. Lord WALSLINGHAM, M.A., F.R.S., President, in the chair.

Mr. George William Carter, M.A., F.L.S., of Lime Grove, Knottingley, Yorkshire; and Mr. R. Newstead, of The Museum, Chester, were elected

Fellows; and Mr. Oliver Goldthwait and Mr. John W. Downing were admitted into the Society.

The Secretary exhibited, on behalf of Mr. J. Edwards, Norwich, two specimens of *Ilybius subæneus*, Er., and a single specimen of *Bidessus unistriatus*, Schr. Mr. Champion alluded to the fact that the only recorded British specimens of the first-mentioned beetle had been taken many years ago at Peckham. The species is very closely allied to *I. fenestratus*, F., but the posterior tarsi of the male have the joints externally margined at their lower edge, whereas in the male of the last-mentioned species they are not margined; this character was very plain in the male specimen sent by Mr. Edwards. Lord Walsingham, in alluding to the exhibit, referred to the list of Norfolk Coleoptera compiled some years ago by Mr. Crotch, which appears to have been lost sight of.

Mr. Verrall exhibited a specimen of a fly in amber, belonging to a genus allied to the genus *Psychoda*.

Mr. M'Lachlan alluded to the damage done by insects to orange-trees in Malta, and stated that the Rev. G. Henslow had lately been studying the question; one of the chief depredators was the widely-spread "fly," *Ceratitis citriperda*, well known as devastating the orange. He found, however, that another and more serious enemy was the larva of a large Longicorn beetle (*Cerambyx miles*, Bon.), which bores into the lower part of the stem and down into the roots, making large galleries; in all probability the larva, or that of an allied species, is the true *Cossus* of the ancients. Lord Walsingham stated that a species of *Prays* allied to *P. oleellus* and our common *P. curtisellus* was known to feed in the buds of the orange and lemon in Southern Europe. Mr. Pascoe, Mr. Champion, and others, took part in the discussion which followed.

The Secretary, on behalf of Miss Carr, exhibited a portfolio of drawings of Indian Lepidoptera and their food-plants.

The following papers were communicated, and were read by the Secretary:—"Notes on the species of the families *Lycidæ* and *Lampyridæ* contained in the Imperial Museum of Calcutta, with descriptions of new species, and a list of the species at present described from India," by the Rev. H. S. Gorham; and "A Catalogue of the Rhopalocerous Lepidoptera collected in the Shan States, with notes on the country and climate," by Mr. N. Manders, Surgeon, Medical Staff. The latter paper contained a very interesting description of the chief physical features of the Shan States and neighbouring parts of Burmah.—H. GOSS & W. W. FOWLER, *Hon. Secs.*

